MECHANICAL ENGINEER

AUV FAULT DETECTION USING MODEL BASED OBSERVER RESIDUALS
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In order for the Navy's next generation Unmanned Undersea Vehicles to be more robust to software/hardware faults, on-line failure detection and resolution is needed. Typically, fault detection methods include limits and trends analysis, model free, and model based techniques. Here, model based observers are proposed for the detection of fault induced dynamic signals in the diving, steering, and roll control systems. Such automatic fault detection systems were designed and implemented in a *Simulink* model of the "2 1UUV." In the course of conducting simulations with the model, numerous vehicle behaviors were studied and detection response was verified. In addition, the model based observer residuals may be designed to distinguish actuator faults from wave disturbances and fin faults from maneuvering responses.

DoD KEY TECHNOLOGY AREAS: Surface/Under Surface Vehicles-Ships and Watercraft, Modeling and Simulation

KEYWORDS: Model Based Observers, 21UUV, AUVs, Fault Detection

TRANSIENT RESPONSE ANALYSIS OF THE 72 INCH TAC-4 RUGGEDIZED SHIPBOARD RACK SUBJECTED TO AN UNDERWATER EXPLOSION EVENT
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The finite element modeling and subsequent transient analysis of the 72 Inch TAC-4 Rugged Rack computer system (configurations 000 1AA and OOO3AA only), currently employed in U.S. Navy shipboard applications, has been performed to determine the system's response to simulated shock inputs. This rack is designed to allow incorporation of commercial-off-the-shelf (COTS) computer systems for naval tactical computing requirements while still meeting MJL-STD-901D, the applicable shock specification. By showing the viability of this computer simulation of the shock response of the current TAC-4 rack system, an argument for a lessening of the actual physical testing requirements for acceptance of future TAC systems can be made.

DoD KEY TECHNOLOGY AREA: Modeling and Simulation

KEYWORDS: Transient Analysis, Finite Element Method, TAC-4, COTS, Shock Analysis, UNDEX

HUMAN MALE AND FEMALE BIODYNAMIC RESPONSE TO UNDERWATER EXPLOSION EVENTS

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Ship survivability is a complex issue. For a ship to remain a viable warfighting asset following damage resulting from enemy munitions such as mines or torpedoes, the ship's crew must remain sufficiently uninjured to be capable of employing the ship's weapons systems. Sophisticated computer simulations of human response, such as those made possible by the Articulated Total Body (ATB) Model, may be used to estimate injury potentials, and thus crew survivability, during underwater explosion events. With this goal in mind, accelerometer data and video footage recorded during live fire testing were used to generate and validate ATB models for both a seated and a standing Hybrid III Anthropomorphic Test Device (ATD). Subsequently, these models were used to estimate the biodynamic response and injury potentials for both male and female human subjects in a vessel subjected to underwater explosion events. This established a method for evaluating crew survivability for a given underwater explosion induced deck excitation.

DoD KEY TECHNOLOGY AREA: Modeling and Simulation

KEYWORDS: Biodynamic Response, Underwater Explosion, Articulated Total Body Program